

48. The process according to Claim 47 wherein said ^{extracted} C₆₀ is ~~recovered~~ in solution of a non-polar organic solvent.

49. The process according to Claim 48 wherein the non-polar organic solvent is benzene, toluene, carbon tetrachloride, 1,1,1-trichloroethane, xylene or alkanes having 5-10 carbon atoms.

50. A process for preparing C₆₀ comprising:

(a) vaporizing a carbon source in the presence of an inert quenching gas under conditions effective to provide a sooty carbon product comprising C₆₀ molecules;

(b) depositing the sooty carbon product on a collecting surface;

(c) removing the sooty carbon product from the collecting surface; and

(d) recovering a product which is predominantly C₆₀ from said sooty carbon product.

51. The process according to Claim ²³² 50 wherein said ^{extracted} C₆₀ is ~~recovered~~ in solid form.

52. The process according to Claim ²³² 50 wherein said ^{extracted} C₆₀ is ~~recovered~~ in solution.

53. The process according to Claim 52 wherein said ^{extracted} C₆₀ is ~~recovered~~ in solution of a non-polar organic solvent.

54. The process according to Claim 53 wherein said non-polar organic solvent is benzene, toluene, carbon tetrachloride, 1,1,1-trichloroethane, xylene or alkanes having 5-10 carbon atoms.

55. The process according to Claim 46 or 51 wherein the C₆₀ in solid form is a crystalline solid.

56. The process of Claim 55 wherein the C₆₀ in solid form is substantially pure solid C₆₀.

57. The process of Claim 55 wherein the C₆₀ in solid form is substantially pure crystalline C₆₀.

Q 58. The process of Claim 45 or ²³²50 wherein C₇₀ is additionally present in the sooty carbon product and is additionally ^{extracted}~~recovered~~ therefrom.

G 59. The process of Claim 45 or ²³²50 wherein C₇₀ is additionally present in the sooty carbon product and is separated from the C₆₀.

60. The process of Claim 59 wherein the C₇₀ separated from said C₆₀ is substantially pure solid C₇₀.

61. The process of Claim 60 wherein the substantially pure solid C₇₀ is substantially pure crystalline C₇₀.

C 62. The process according to Claim 45 or ²³²50 wherein ^{extracting}~~the recovering step~~ comprises contacting the sooty carbon product with a non-polar organic solvent effective to dissolve the C₆₀, said solvent being present in amounts sufficient to dissolve the C₆₀ present in said sooty carbon product.

C 63. The process according to Claim 62 wherein the ~~recovering step~~ further comprises separating from said solvent a solid C₆₀.

G 64. The process of Claim 45 or ²³²50 wherein ^{extracting}~~the recovering step~~ comprises subliming the C₆₀ from the sooty carbon product and condensing the sublimed C₆₀.

G 65. The process of Claim ²³²50 wherein ~~the~~ depositing ~~step~~ comprises collecting the sooty carbon product on a collecting surface distanced 5-10 cm from said vaporization.

sub c3 66. The process of Claim 45 or 50 wherein the carbon source is vaporized in an evacuated reactor.

G F 67. The process of Claim 45 or ²³²50 wherein ^{elemental carbon}~~the carbon source~~ is vaporized in a bell jar carbon evaporator.

G 68. The process of Claim 45 or ²³²50 wherein ^{elemental}~~the carbon source~~ subject to vaporization is graphite, or amorphous or glassy carbon.

69. The process of Claim 68 wherein the ^{elemental} carbon ~~source~~ subject to vaporization is graphite.

70. The process of Claim 45 or ²³² ~~50~~ wherein the ^{elemental} carbon ~~source~~ subject to vaporization is graphite rods.

71. The process of Claim 45 or ²³² ~~50~~ wherein the ^{elemental} carbon ~~source~~ is vaporized by passing an electrical current of sufficient intensity through said carbon source to produce the sooty carbon product.

72. The process of Claim 71 wherein the electrical current is about 100 amps.

73. The process of Claim 45 or ²³² ~~50~~ wherein the inert quenching gas is a noble gas.

74. The process of Claim 73 wherein the noble gas is helium or argon.

75. The process of Claim ²³² ~~50~~ wherein the collecting substrate is a glass surface.

76. The process of Claim 62 wherein the non-polar organic solvent is carbon disulfide, benzene, carbon tetrachloride or toluene.

77. The process of Claim 76 wherein the solvent is benzene.

78. The process of Claim 63 wherein separating the solid C₆₀ from the solvent comprises evaporating the solvent.

79. The process of Claim 63 further comprising the step of purifying the solid C₆₀.

80. The process of Claim 79 wherein the purifying step is sublimation, crystallization, column chromatography, capillary electrophoresis, HPLC, preparative thin-layer chromatography or extraction.

81. The process of Claim 64 wherein the C₆₀ is sublimed from the sooty carbon product at 300-400°C.

82. The process of Claim 64 wherein the sublimation step comprising heating the C_{60} in a vacuum or inert atmosphere at effective sublimation temperatures to extract C_{60} from said sooty carbon product.

83. A process for preparing C_{60} comprising:

(a) vaporizing a ^{elemental} carbon source in the presence of an inert quenching gas under conditions effective to form a sooty carbon product comprising C_{60} molecules, said C_{60} molecules being present in said sooty carbon product in amounts sufficient to be capable of providing a visibly colored solution when extracted with sufficient amounts of benzene; and

(b) recovering C_{60} from said sooty carbon product.

84. A process for preparing C_{60} comprising:

(a) vaporizing a carbon source in the presence of an inert quenching gas under conditions effective to provide a sooty carbon product comprising C_{60} molecules, said C_{60} molecules being present in said sooty carbon product in amounts sufficient to be capable of providing a visibly colored solution when extracted with benzene;

(b) depositing the sooty carbon product on a collecting surface;

(c) removing the sooty carbon product from the collecting surface; and

(d) recovering a product which is predominantly C_{60} from said sooty carbon product.

85. The process according to Claim 83 or 84 wherein the C_{60} is present in amounts sufficient to form a solid.

86. The process of Claim 85 wherein the C_{60} is substantially pure solid C_{60} .

87. The process of Claim 86 wherein the C_{60} in solid form is substantially pure crystalline C_{60} .

88. The process according to Claim 83 or 84 wherein the C_{60} is recovered in solution.

89. The process of Claim 83 or 84 wherein C_{70} is additionally present in the sooty carbon product and is additionally recovered therefrom.

90. The process of Claim 83 or 84 wherein C_{70} is additionally present in the sooty carbon product and is separated from the C_{60} .

91. The process of Claim 90 wherein the C_{70} separated from said C_{60} is substantially pure solid C_{70} .

92. The process of Claim 91 wherein the substantially pure solid C_{70} is substantially pure crystalline C_{70} .

93. The process according to Claim 83 or 84 wherein the recovering step comprises contacting the sooty carbon product with a non-polar organic solvent effective to dissolve C_{60} molecules, said solvent being present in an amount sufficient to dissolve the C_{60} molecules present in said sooty carbon product and separating from said solvent a product predominantly of C_{60} .

94. The process according to Claim 93 wherein the C_{60} separated from said solvent is a solid.

95. The process of Claim 83 or 84 wherein the recovering step comprises subliming the C_{60} from the sooty carbon product and condensing the sublimed C_{60} .

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~~96. The process of Claim 84 wherein the depositing step comprises collecting the sooty carbon product on a collecting surface distanced 5-10 cm from said vaporization.~~

~~97. The process of Claim 83 or 84 wherein the carbon source is vaporized in an evacuated reactor.~~

~~98. The process of Claim 83 or 84 wherein the carbon source is vaporized in a bell jar carbon evaporator.~~

99. The process of Claim 83 or 84 wherein the carbon source subject to vaporization is graphite, or amorphous or glassy carbon.

100. The process of Claim 99 wherein the carbon source subject to vaporization is graphite.

101. The process of Claim 83 or 84 wherein the carbon source subject to vaporization is graphite rods.

102. The process of Claim 83 or 84 wherein the carbon source is vaporized by passing an electrical current of sufficient intensity through said carbon source to produce the sooty carbon product.

103. The process of Claim 102 wherein the electrical current is about 100 amps.

104. The process of Claim 83 or 84 wherein the inert quenching gas is a noble gas.

105. The process of Claim 104 wherein the noble gas is helium or argon.

106. The process of Claim 84 wherein the collecting substrate is a glass surface.

107. The process of Claim 93 wherein the non-polar organic solvent is carbon disulfide, benzene, carbon tetrachloride or toluene.

108. The process of Claim 107 wherein the solvent is benzene.

109. The process of Claim 94 wherein separating the solid C_{60} from the solvent comprises evaporating the solvent.

110. The process of Claim 93 further comprising the step of purifying the solid C_{60} .

111. The process of Claim 110 wherein the purifying step is sublimation, crystallization, column chromatography, capillary electrophoresis, HPLC, preparative thin-layer chromatography or extraction.

112. The process of Claim 111 wherein the C_{60} is sublimed from the sooty carbon product at 300-400°C.

113. The process of Claim 95 wherein the sublimation step comprising heating the C_{60} in a vacuum or inert atmosphere at effective sublimation temperatures to extract C_{60} from said sooty carbon product.

114. A process for preparing caged molecules consisting solely of carbon atoms comprising:

(a) vaporizing a carbon source in the presence of an inert quenching gas under conditions effective to form a sooty carbon product containing said caged molecules of carbon, said caged molecules being present in said sooty carbon product in sufficient amounts to be capable of extracting and recovering therefrom said caged molecules as a solid; and

(b) recovering said caged molecule of carbon from said sooty carbon product.

115. The process of Claim 114 which the caged molecules are recovered in the solid form.

116. The process of Claim 114 in which the caged molecule are recovered in solution.

117. The process of Claim 116 in which the caged molecules are recovered in solution in a non-polar organic solvent.

118. A process for preparing caged molecules consisting solely of carbon atoms comprising:

(a) vaporizing a carbon source in the presence of an inert quenching gas under conditions effective to provide a sooty carbon product comprising said caged molecules of carbon, said caged molecules being present in said sooty carbon product in amounts sufficient to be capable of extracting and recovering therefrom said caged molecules in solid form;

(b) depositing the sooty carbon product on a collecting surface;

(c) removing the sooty product from the collecting surface; and

(d) recovering a product which comprises caged molecules consisting solely of carbon atoms from said sooty carbon product.

119. A process for preparing caged molecules consisting solely of carbon atoms comprising:

(a) vaporizing a carbon source in the presence of an inert quenching gas under conditions effective to form a sooty carbon product comprising said caged molecules, said caged molecule being present in said sooty carbon product in amounts sufficient to provide a visibly colored solution when extracted with effective amounts of benzene; and

(b) recovering said caged molecule from said sooty carbon product.

120. A process for preparing caged molecules consisting solely of carbon atoms comprising:

(a) vaporizing a carbon source in the presence of an inert quenching gas under conditions effective to provide a sooty carbon comprising said caged molecules of carbon, said caged molecules being present in said sooty carbon product in amounts sufficient to be capable of providing a colored solution when extracted with benzene;

(b) depositing the sooty carbon product on a collecting surface;

(c) removing the sooty carbon product from the collecting surface; and

(d) recovering a product predominantly of said caged molecules.

121. The process of any one of Claims 118-120 in which the caged molecules are recovered in solid form.

122. The process of any one of Claims 118-120 in which the caged molecules are recovered in solution.

123. The process of any one of Claims 118-120 in which the caged molecules are recovered in solution in a non-polar organic solvent.

124. A process for preparing a carbon allotrope comprising:

(a) vaporizing a carbon source in the presence of an inert quenching gas under conditions to form a sooty carbon product comprising the carbon allotrope, said carbon allotrope being capable of being dissolved in non-polar solvents and said carbon allotrope being present in said sooty carbon product in amounts sufficient to be capable of providing a visibly colored solution when extracted with effective amounts of benzene; and

(b) recovering said allotrope of carbon from said sooty carbon product.

125. A process for preparing a carbon allotrope comprising:

(a) vaporizing a carbon source in the presence of an inert quenching gas under conditions effective to provide a sooty carbon product comprising said carbon allotrope, said carbon allotrope being present in said sooty carbon product in amounts sufficient to be capable of providing a visibly colored solution when dissolved in sufficient amounts of benzene;

(b) depositing the sooty carbon product on a collecting surface;

(c) removing the sooty carbon product from the collecting surface; and

(d) recovering a product which comprises said carbon allotrope.

126. A process for preparing a carbon allotrope comprising:

(a) vaporizing a carbon source in the presence of an inert quenching gas under conditions effective to form a sooty carbon product comprising said carbon allotrope, said carbon allotrope being capable of being dissolved in a non-polar organic solvent and said carbon allotrope being present in said sooty carbon products in sufficient quantities to be capable of extracting and recovering therefrom said allotrope in solid form; and

(b) recovering said allotrope from said sooty carbon product.

127. A process for preparing a carbon allotrope comprising:

(a) vaporizing a carbon source in the presence of an inert quenching gas under conditions effective to provide a sooty carbon product comprising an allotrope of carbon, said carbon allotrope being capable of being dissolved in a non-polar organic solvent and said carbon allotrope being present in sufficient quantities in said sooty carbon product to be capable of extracting and recovering therefrom the allotrope in solid form;

(b) depositing the sooty carbon product on a collecting surface;

(c) removing the sooty carbon product from the collecting surface; and

(d) recovering a product which is an allotrope of carbon from said sooty carbon product.

128. The process of any one of Claims 124-127 in which the allotrope is recovered in solid form.

129. The process of any one of Claims 124-127 in which the allotrope is recovered in solution.

130. The process of any one of Claims 124-127 in which the allotrope is recovered in solution in a non-polar organic solvent.

131. A process for preparing a soluble carbon product consisting solely of carbon that is soluble in non-polar organic solvents comprising:

(a) vaporizing a carbon source in the presence of an inert quenching gas under conditions effective to form a sooty carbon product comprising the soluble carbon product, said soluble carbon product being present in sufficient quantities in said sooty carbon product to be capable of extracting and recovering therefrom said soluble carbon product in solid form; and

(b) recovering said soluble carbon product from said sooty carbon product.

132. A process for preparing a soluble carbon product consisting solely of carbon that is soluble in non-polar organic solvents comprising:

(a) vaporizing a carbon source in the presence of an inert quenching gas under conditions effective to form a sooty carbon product comprising the soluble carbon product, said soluble carbon product being present in sufficient quantities in said sooty carbon product to be capable of providing a colored solution when extracted with effective amounts of benzene; and

(b) recovering said soluble carbon product.

133. A process for preparing a soluble carbon product consisting solely of carbon atoms that is soluble in non-polar organic solvents comprising:

(a) vaporizing a carbon source in the presence of an inert quenching gas under conditions effective to provide a sooty carbon product comprising said soluble carbon product, said soluble carbon product being present in said sooty carbon

product in amounts sufficient to be capable of extracting and recovering therefrom said soluble carbon product in solid form;

(b) depositing the sooty carbon product on the collecting surface;

(c) removing the sooty product from the collecting surface; and

(d) recovering the soluble carbon product from said sooty carbon product.

134. A process for preparing a soluble carbon product consisting solely of carbon atoms that is soluble in non-polar organic solvents comprising:

(a) vaporizing a carbon source in the presence of an inert quenching gas under conditions effective to provide a sooty carbon product comprising said soluble carbon product, said soluble carbon product being present in said sooty carbon product in amounts sufficient to be capable of providing a visibly colored solution when said soluble carbon product is dissolved in benzene;

(b) depositing the sooty carbon product on the collecting surface;

(c) removing the sooty product from the collecting surface; and

(d) recovering the soluble carbon product.

135. The process according to any one of Claims 131-134 in which the soluble carbon product is recovered in solid form.

136. The process according to any one of Claims 131-134 in which the soluble carbon product is recovered in solution.

137. The process according to any one of Claims 131-134 in which the soluble carbon product is recovered in solution in an inert non-polar organic solvent.

138. A process for producing a sooty carbon product comprising:

(a) vaporizing a carbon source in the presence of an inert gas to produce a carbon vapor; and

(b) quenching said vapor of carbon in said inert gas under conditions effective to nucleate and condense said vapor of carbon into a sooty carbon product comprising C_{60} , said C_{60} being present in said sooty carbon product in amounts sufficient to be capable of extracting and recovering therefrom said C_{60} in solid form.

139. A process of producing a sooty carbon product comprising:

(a) vaporizing a carbon source in the presence of an inert gas to produce a carbon vapor; and

(b) quenching said vapor of carbon in said inert gas under conditions effective to nucleate and condense said vapor of carbon into a sooty carbon product comprising caged molecules consisting solely of carbon atoms, said caged molecules being present in said sooty carbon product in amounts sufficient to be capable of extracting and recovering therefrom said caged molecule in solid form.

140. A process of producing a sooty carbon product comprising:

(a) vaporizing a carbon source in the presence of an inert gas to produce a carbon vapor; and

(b) quenching said vapor of carbon in said inert gas under conditions effective to nucleate and condense said vapor of carbon into a sooty carbon product comprising an allotrope of carbon capable of being dissolved in non-polar organic solvents, said allotrope being present in said sooty carbon product in amounts sufficient to be capable of extracting and recovering therefrom said allotrope in solid form.

141. A process of producing a sooty carbon product comprising:

(a) vaporizing a carbon source in the presence of an inert gas to produce a carbon vapor; and

(b) quenching said vapor of carbon in said inert gas under conditions effective to nucleate and condense said vapor of carbon into a sooty carbon product comprising a soluble carbon product consisting solely of carbon atoms that dissolves in non-polar organic solvents, said soluble carbon product being present in said sooty carbon product in amounts sufficient to be capable of extracting and recovering therefrom said soluble carbon product in solid form.

142. A process of producing a sooty carbon product comprising:

(a) vaporizing a carbon source in the presence of an inert gas to produce a carbon vapor; and

(b) quenching said vapor of carbon in said inert gas under conditions effective to nucleate and condense said vapor of carbon into a sooty carbon product comprising C_{60} , said C_{60} being present in amounts sufficient to be capable of providing a visibly colored solution when extracted with effective amounts of benzene.

143. A process of producing a sooty carbon product comprising:

(a) vaporizing a carbon source in the presence of an inert gas to produce a carbon vapor; and

(b) quenching said vapor of carbon in said inert gas under conditions effective to nucleate and condense said vapor of carbon into a sooty carbon product comprising caged molecules consisting solely of carbon atoms, said caged molecules being present in amounts sufficient to be capable of providing a

visibly colored solution when extracted with effective amounts of benzene.

144. A process of producing a sooty carbon product comprising:

(a) vaporizing a carbon source in the presence of an inert gas to produce a carbon vapor; and

(b) quenching said vapor of carbon in said inert gas under conditions effective to nucleate and condense said vapor of carbon into a sooty carbon product comprising an allotrope of carbon capable of being dissolved in non-polar organic solvents, said allotrope being present in amounts sufficient to be capable of providing a visibly colored solution when extracted with effective amounts of benzene.

145. A process of producing a sooty carbon product comprising:

(a) vaporizing a carbon source in the presence of an inert gas to produce a carbon vapor; and

(b) quenching said vapor of carbon in said inert gas under conditions effective to nucleate and condense said vapor of carbon into a sooty carbon product comprising a soluble carbon product consisting solely of carbon atoms that dissolves in non-polar organic solvents, said soluble carbon product being present in amounts sufficient to be capable of providing a visibly colored solution when extracted with effective amounts of benzene.

146. The process according to Claim 138 or 142 wherein C_{70} is additionally present.

147. The process according to any one of Claims 138-145 in which the carbon source subject to vaporization is graphite, or amorphous or glassy carbon.

148. The process according to Claim 147 in which the carbon source subject to vaporization is graphite.

149. The process according to Claim 148 in which the carbon source subject to vaporization is graphite rods.

150. The process according to any of Claims 138-145 in which the carbon source is vaporized in an evacuated reactor.

151. The process according to Claim 150 in which the carbon source is vaporized in a bell jar carbon evaporator.

152. The process according to any of Claims 138-145 in which the inert gas is a noble gas.

153. The process according to Claim 152 in which the inert gas is helium or argon.

154. The process of any of Claims 138-145 which further comprises recovering the sooty carbon product.

155. The process of Claim 154 wherein the recovering step comprises depositing the sooty carbon product on a collecting surface and removing the sooty carbon product from the collecting surface.

156. The process of Claim 155 wherein the depositing step comprises collecting the sooty carbon product on a collecting surface distanced 5-10 cm from said vaporization.

157. The process of any one of Claims 140, 141, 144 or 145 wherein the non-polar organic solvent is carbon disulfide, benzene, toluene, carbon-tetrachloride, 1,1,1-trichloroethane, xylene, or alkanes having 5-10 carbon atoms.

158. The process of any one of Claims 138-145 wherein the carbon source is vaporized by passing an electrical current of sufficient intensity through said carbon source to produce the sooty carbon product.

159. The process of Claim 158 wherein the electrical current is about 100 amps.

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160. A process for preparing a carbon allotrope comprising caged molecules consisting solely of carbon atoms which are soluble in non-polar organic solvent, said process

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comprising vaporizing a carbon source in the presence of an inert gas to produce a carbon vapor, quenching said vapor of carbon in said inert gas under conditions effective to nucleate and condense said vapor of carbon into a sooty carbon product containing said carbon allotrope, said allotrope being present in said sooty carbon product in amounts sufficient to be capable of extracting and recovering therefrom said allotrope in solid form, and recovering said carbon allotrope from said sooty carbon product.

161. The process according to Claim 160 in which the carbon allotrope is C_{60} .

162. The process according to Claim 160 in which the carbon allotrope is C_{70} .

163. The process according to Claim 160 in which the carbon allotrope is recovered in solid form.

164. The process according to Claim 163 in which the solid carbon allotrope is a crystalline solid.

165. The process according to Claim 160 in which the carbon allotrope that is ~~recovered~~^{extracted} is substantially pure.

166. The process according to Claim 164 in which the crystalline solid of the carbon allotrope is substantially pure.

167. The process according to any one of Claims 163-166 in which the carbon allotrope is C_{60} .

168. The process according to any one of Claims 163-166 in which the carbon allotrope is C_{70} .

169. The process according to Claim 160 wherein the ~~recovering~~^{extracting} step comprises contacting the sooty carbon product with a non-polar organic solvent effective to dissolve the carbon allotrope, said solvent being present in an amount sufficient to dissolve the carbon allotrope present in said sooty carbon products and separating therefrom the carbon allotrope.